Government of Saskatchewan

Annual Report for the year ending March 31,1989

Saskatchewan Science and Technology

90-03469/

Saskatchewan
Science and
Technology

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Title page photo: RADARSAT– A highly sophisticated remote sensing satellite which, when launched in 1994, will represent one of the world's most advanced surveillance satellites used for global environmental monitoring and surveillance of natural phenomena.

Letters of transmittal

Minister's Transmittal

Ray Meiklejohn, Minister

December 8, 1989

To Her Honour,
The Honourable Sylvia O. Fedoruk, O.C., S.O.M.
Lieutenant-Governor of the Province of Saskatchewan

I have the honour to submit this Annual Report on the activities of Saskatchewan Science and Technology for the year ending March 31, 1989.

These are indeed exciting times for Saskatchewan's advanced technology sector! With but one decade left in the twentieth century, world markets are in transition, bringing us closer to a global economy than ever before. Increasingly, advanced technology goods and services offer new opportunities for economic well-being. In seeking to sustain and enhance its prosperity by participating in a growing volume of world trade, Saskatchewan faces the critical challenge of adapting its policies, practices and institutions to this radically new environment.

Wealth and job creation, now and in the future, depend on growth of knowledge-intensive industries and the application of new technologies to keep established industry competitive. This wealth-generating capability enables investment in quality of life services such as education, health care and other personal and social benefits. If we are to provide new jobs, solve environmental, health and safety problems, keep our resource industries competitive, create new products, and educate our children for the future, we must be players in the international field of science and technology.

Saskatchewan's advanced technology industry is of strategic importance to the economic diversification and sustained growth of the Province. Advanced technology sectors such as biotechnology, communications, microelectronics, software, instrumentation and advanced materials are expected to realize the fastest rate of industrial growth during the 1990's. Advanced technology is more than an industry. It provides input to many other industries by developing new products and processes which enhance their competitiveness.

With an overall mandate to help develop and maintain quality jobs for Saskatchewan residents through investment in science and technology, Saskatchewan Science and Technology has developed a partnership with industry, universities, research institutions and other governments in order to ensure competitiveness in an increasingly sophisticated marketplace. This Annual Report represents the results of that partnership in 1988-89.

Respectfully Submitted,

Ray Meiklejohn

Ray Meiklejohn
Minister,
Saskatchewan Science and Technology

Deputy Minister's transmittal

Harley D. Olsen, Deputy Minister

December 8, 1989

To the Honourable Ray Meiklejohn
Minister of Science and Technology

Dear Mr. Meiklejohn:

I have the honour of submitting the Annual Report of Saskatchewan Science and Technology for the year ending March 31, 1989.

Respectfully submitted,

Harley D. Olsen
Deputy Minister,
Saskatchewan Science and Technology

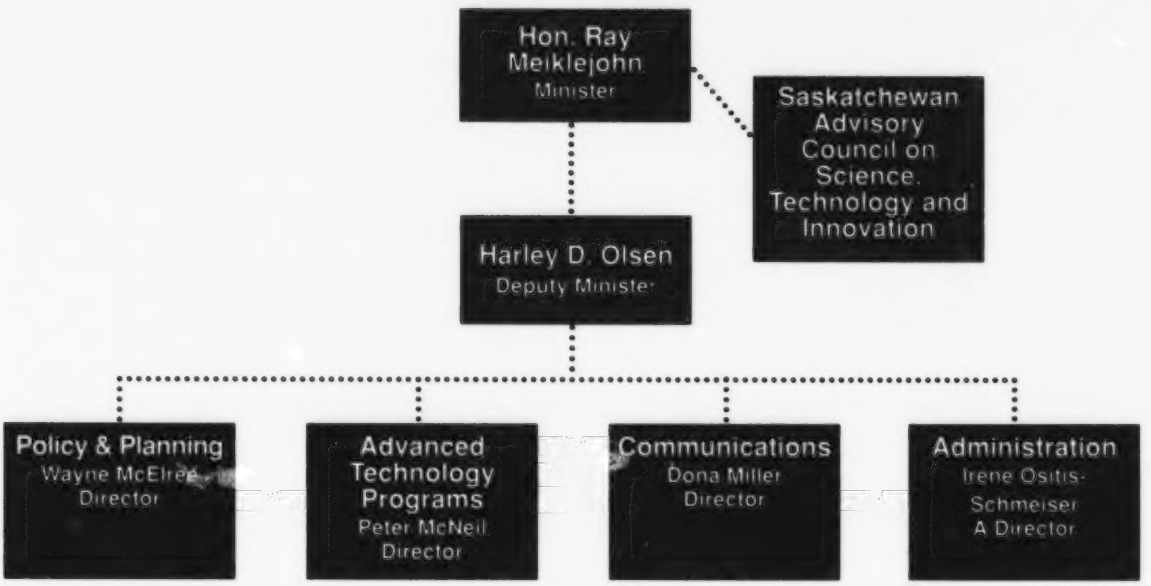
Saskatchewan Science and Technology Mandate

Saskatchewan Science and Technology is responsible for all matters relating to the development, co-ordination, application and promotion of science and technology activity in Saskatchewan. Its mission is to support the creation and maintainance of quality jobs for Saskatchewan residents through encouraging investment in science and technology.

Specifically, Saskatchewan Science and Technology works to:

- Stimulate the development of an industrially-based advanced technology sector by supporting each stage of the innovation cycle, from research through product design, market planning and commercialization.
- Assist in diversification of the Saskatchewan economy through development of new products and processes to expand existing markets and establish new ones at home and abroad.
- Assist Saskatchewan small business in acquiring new technologies to make them more effective and efficient.
- Support efforts to develop a world-class research infrastructure in Saskatchewan in order to attract leading edge research capabilities and produce associated spin-off industrial opportunities.
- Support efforts to develop a more efficient and diverse resource sector through new product research and development.
- Coordinate the research, science and technology activities of industry, government, universities and public research institutions.
- Promote and co-operate in international, federal, and inter-provincial science and technology initiatives to develop new opportunities for Saskatchewan.
- Create awareness of educational and employment opportunities in science and technology fields to ensure an adequate future source of trained scientists, technicians and entrepreneurs.
- Increase public awareness of the importance of science and technology to Saskatchewan's future economic and social well-being.

Science and Technology Organization as of March 31, 1989



Consultative Mechanisms

Through a network of government and industry contacts, Saskatchewan Science and Technology extends and refines its activities in order to ensure that the Province's industry and the wider economy are receiving the most effective support possible in the increasingly competitive global environment.

A number of consultative mechanisms have been established in order to effectively build meaningful partnerships between industry, universities, research institutions and other government organizations:

Council of Science and Technology Ministers

The Council, consisting of federal and provincial ministers responsible for science and technology, was established in 1987 and is responsible for coordinating the implementation of the National Science and Technology Policy. This Policy was approved in 1987 to bring science and technology fully to bear on the economic, social, cultural and regional development of Canada by encouraging cooperation among governments and between the public and private sectors.

Western Science and Technology Ministers Forum

In recognition of common development needs and limited resources, the four Western provinces' science and technology ministers have established a regular forum for collaboration. Ongoing work in this forum includes joint research projects, sharing of research facilities, joint technology/industry development projects, and information exchange.

Saskatchewan Advisory Council on Science, Technology and Innovation

In recognition of the increasing strategic importance of science and technology to the advancement of all economic and social sectors, the government established this Council in February 1989. Its purpose is to advise the Minister of Science and Technology and the provincial Cabinet on the development of policies for the application of science, technology and innovation in order to strengthen and diversify the Saskatchewan economy in the world marketplace.

(See Appendix, Table 3 for complete Council listing)

Department Activities

Policy and Planning Division

The Policy and Planning Division ensures that Saskatchewan receives maximum benefit from money spent on science, technology and innovation by provincial, federal and international governments. In support of this function, the Division ensures the continued responsiveness of government policies and programs to the needs of the advanced technology industry and the innovation process in Saskatchewan. As well, specific developmental initiatives in strategic areas of science and technology are undertaken to assist the growth and diversification of the provincial economy.

A. STRATEGIC INITIATIVES

1. Agricultural Biotechnology

Work continued on the establishment of an organization to develop this significant research and development area into a viable commercial sector. In August 1988, Ag-West Biotech Inc. was officially established as a not-for-profit corporation to lead Saskatchewan's efforts in this area. Ag-West Biotech Inc. will receive a research and development fund for use in developing initiatives and attracting investment from the federal government and industry partners, both inside and outside the Province.

In this area, work is carried out extensively with the National Agricultural Biotechnology Initiative (NABI), a $25 million Western Canada fund to promote the commercialization of agricultural biotechnology research in the West.

2. Space Sector

In space technology, efforts focussed on expanding the prairie leadership role of Saskatoon-based SED Systems Inc. in the $3 billion Canadian Space Program. Negotiations on a cost-sharing arrangement for the construction of RADARSAT, Canada's first radar resource monitoring satellite, neared completion. It is expected that some $20 million in RADARSAT contracts will flow to SED Systems and supporting Saskatchewan companies during the period 1989-94, contributing to a total of 300 person years of advanced technology work in the Province.

In addition, a study was cost-shared with Industry, Science and Technology Canada to investigate the feasibility of establishing a Canadian Space Control Centre in Saskatoon. Such a facility would control and monitor scientific satellites and space platforms in support of national and international space activities. This study will be completed in the summer of 1989.

Related to this effort, a Task Force of Western Provinces and their leading space companies — Bristol Aerospace in Manitoba, SED Systems in Saskatchewan, Intera Technologies in Alberta and MacDonald, Dettwiler and Associates in British Columbia — was established to develop an earth environment monitoring space initiative for consideration by the Canadian Space Agency as a major space/industry development project for the 1990's. Negotiations on this and the Canadian Space Control Centre will begin in 1989/90.

3. Federal Procurement

During 1988/89 the strategic importance of advanced technology procurement was addressed. Total federal procurement in Canada in 1987-88 approached $10 billion, with science and technology procurement nearing $300 million.

Saskatchewan received approximately $3.4 million or 1.6 percent in federal advanced technology procurement in 1988-89.

(See Appendix, Table 4)

Working with Western Economic Diversification, Industry, Science and Technology Canada and the Buy Saskatchewan Agency, Saskatchewan Science and Technology co-funded an investigation into advanced technology procurement opportunities for Saskatchewan companies in space, transportation and defence. The study concluded that significant procurement opportunities exist in these areas between now and the end of the century, but noted that increased attention must be paid to market opportunity awareness and supplier capability development. This study is expected to form the basis for a major Procurement Opportunities Conference in 1989/90, as well as possible supplier development programming in the near future.

Work was also initiated with the province of British Columbia to secure industrial opportunities for Saskatchewan firms from the proposed $600 million expansion of the University of British Columbia nuclear physics research centre known as TRIUMF/KAON. If this project receives federal and international funding, it is expected that there will be technology procurement opportunities in the range of $300 million Canada-wide.

4. Networks of Centres of Excellence Program

Saskatchewan activity was encouraged in the $240 million Networks of Centres of Excellence Program. These Networks are meant to encourage the formation of university/industry teams to conduct leading edge world-class research and development. Application development funding was provided to university/industry teams to enable Saskatchewan participation in some sixty national network proposals (See Appendix, Table 5). Final funding decisions are expected in the fall of 1989.

5. Policy Development

The Division monitored, analysed and coordinated policy positions on federal initiatives such as the Free Trade Agreement, Bill C-22 pharmaceutical research and development, biotechnology regulation, environmental protection/sustainable economic development, and the federal science and technology strategy known as InnovAction.

B. EDUCATIONAL INITIATIVES

The Division continued to encourage Saskatchewan youth to pursue interests and careers in science, technology and entrepreneurship through the following programs:

1. Canada Scholarship Program

In 1988, a total of 85 Saskatchewan students received scholarships worth $2,000 per year for four years to assist in their pursuit of careers in the natural sciences, engineering and related disciplines.

2. Science Fairs

The Division continued to implement initiatives to ensure the long term development of science and technology in Saskatchewan. These included a program to expand the number of regional Science Fairs in Saskatchewan, and continuation of the Department's Science Fair Awards Program to recognize student achievement in local Science Fairs.

Such Fairs are an investment in Saskatchewan's future human resource base as they demonstrate to students the rewards of creatively applying their science and math skills in developing working science and technology projects.

3. Shad Valley

The Shad Valley Program is a summer university/work program in science/entrepreneurship for exceptional Grade XI and XII students. The Division worked with industry to co-sponsor two Saskatchewan students to the 1988 Shad Valley Program. As a result of this experience, the Department will embark on a three year program in 1989 to expand the number of Saskatchewan students participating in Shad Valley. Ultimately, it is hoped that a full program will be established in Saskatchewan.

C. UNIVERSITY/INDUSTRY LIAISON

The Offices of Research Services at the University of Saskatchewan and the University of Regina received funding during 1988/89 to assist with development of technology application by Saskatchewan industry. Workshops and promotional materials were used to increase university interaction with industry, thereby encouraging joint Research and Development (R&D) ventures leading to industrial diversification.

Specific university/industry projects under development during 1988/89 included ultrasound image software, rhizobacterial inoculants, intelligent buildings, Anti-AIDS compound development, dual fuel systems, and computerized geographical information systems for forest management.

The Division also contracted an assessment of successful university/ industry R&D mechanisms in North America to assist in building even more productive approaches in Saskatchewan. The results of this assessment will be reviewed in 1989-90 for possible future application.

D. INTERNATIONAL ACTIVITY

International efforts during 1988/89 focussed on implementing the Third Plan of Action under the Saskatchewan/Jilin Twinning Agreement with China.

Specific areas included telecommunications and data switch cooperation, biotechnology, technology exchange in farm machinery, grain storage, wind and solar power, cooperation in livestock infectious disease control, and land reclamation. A number of Jilin delegations were received during the year, and Memoranda of Understanding were signed by the Saskatchewan Research Council and the Prairie Agricultural Machinery Institute with their Chinese counterparts in the areas of farm equipment design/manufacturing and crop utilization/agricultural processing.

The Division consulted with Canada's overseas science and technology counsellors as part of an extensive program of information distribution in support of the Province's advanced industrial and research capabilities.

Particular attention was paid to international opportunities in the Asia Pacific, European and U.S. markets. Asia Pacific interactions included the Asia Pacific Foundation and the Hong Kong Canada Business Association.

E. STATISTICAL MONITORING

The Division continued to track R&D expenditures by provincial departments, the federal government and other Saskatchewan agencies. A total of $148 million was expended on R & D in Saskatchewan in 1987-88, the latest year for which data is available (See Appendix, Table 6). The largest contributors were the federal government, the private sector and the provincial government, together accounting for over 85% of this expenditure. Saskatchewan ranks fifth in terms of provincial government funding of R & D, and third on a per capita basis.

In terms of total science and technology expenditures, the federal government expended a total of $91 million in Saskatchewan in 1988-89. This represents 2.3% of total expenditures across Canada. Efforts are continuing to encourage the federal government to increase its expenditures to a level which more closely approaches Saskatchewan's national population share.

Advanced Technology Programs Division

Advanced technology strengths in Saskatchewan include biotechnology, communications, computer software, instrumentation, and satellite control and test equipment. These technologies are inherently knowledge-based and are advancing at an incredible pace. They are expected to result in major sources of new employment and wealth creation throughout the next decade and the 21st century. Saskatchewan's advanced technology industry is making impressive strides in many of these fields and is positioning itself to participate in anticipated industrial development opportunities.

The Advanced Technology Programs Division works directly with advanced technology companies, supporting all components of the innovation process.

Assistance is available to innovators and entrepreneurs for developing and evaluating ideas, and for putting these ideas to work in the development of new technology for sale in domestic and international markets. The Division administers a number of financial assistance programs designed to share the risk with companies undertaking industrial research and development and to encourage commercialization of the resulting leading edge products.

A. SERVICES TO INDUSTRY

1. Financial Assistance Programs

a) Research and Development Programs

Companies working in advanced technology are under continual pressure to develop and introduce new or improved products. These companies must therefore invest a significant percentage of their earnings on research and development.

The Advanced Technology Programs Divison shares the risk of innovation with Saskatchewan entrepreneurs through financial assistance made available under a seven part Research and Development Program. This fiscal year, assistance of $1,702,120 was authorized for 51 research and development projects conducted by 29 companies and organizations.

(See Appendix, Table 1)

b) Advanced Technology Agreement Programs

In addition to the requirement for ongoing research and development, other factors critical to successful advanced technology business development include a supportive research infrastructure, adequate financing, and sound marketing strategies. The assistance programs delivered by the Advanced Technology Programs Division under the Canada-Saskatchewan Subsidiary Agreement on Advanced Technology respond to these special needs. During this fiscal year, $2,824,114 in financial assistance was approved by the federal and provincial governments under this Agreement for a variety of projects. The provincial commitment to these projects totalled $1,235,287.

(See Appendix, Table 2)

2. Industry Advisory Service

The staff in the Division consult regularly with entrepreneurs and advanced technology firms, providing advice on business planning, funding sources and technology development. This counselling function assists technology innovators in developing technologically and commercially viable products and businesses. These, in turn, diversify the Saskatchewan economy and provide jobs in highly skilled and highly paid fields for Saskatchewan people.

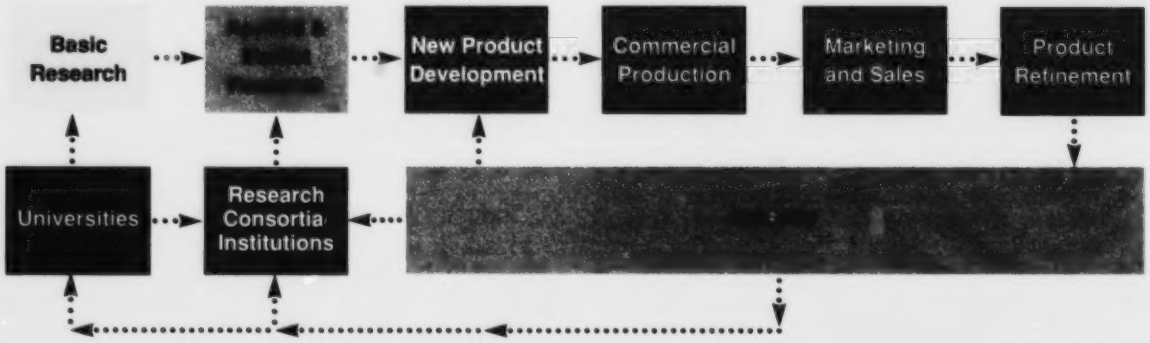
3. Advocacy

Making the right connections is key to building an integrated, vibrant and successful advanced technology sector in Saskatchewan. Because of the diverse and complex nature of this industry, it takes a concerted effort to make these connections. The Advanced Technology Programs Division performs an advocacy role by working to make viable connections between components of the innovation process, as well as between the people involved in innovation.

B. UNIVERSITY/INDUSTRY CONNECTIONS

Centres of advanced technology often develop around strong teaching and research-oriented universities possessing an entrepreneurial spirit. Many of the Province's advanced technology companies trace their roots to Saskatchewan universities. The universities also offer an abundant source of research expertise and facilities to support the growth of advanced technology companies. The Advanced Technology Programs Division works with industry and the universities to identify opportunities for collaboration and technology commercialization.

The Innovation Process



Communications Division

The mandate of the Communications Division of Saskatchewan Science and Technology is to coordinate the flow of information between the Department and the various publics it serves. Audiences include industry and research communities, business, governments, educators, students, and the general public. Special attention is paid to the raising of public awareness of science and technology and its potential to diversify the Province's economy. Emphasis is particularly placed on initiatives which will increase Saskatchewan's profile nationally and internationally.

Supporting the work of other divisions of the Department, the Communications Division has developed an integrated communications strategy, and continually produces appropriate tools to support this strategy. Activities during this fiscal year include:

A. PUBLICATIONS

The Department produced its first Software Directory in 1988/89, providing an inventory of the capabilities, products and services of our Province's software developers. Distributed provincially, nationally and internationally, this publication has served as an effective procurement guide for both private and public sectors.

Also introduced this year was a booklet entitled Science and Technology Facts which provides details on provincial and federal science and technology expenditures. This booklet was designed as a reference tool, comparing provincial and federal performance in directing resources toward the attainment of national and provincial economic diversification objectives.

The Department newsletter, "Frontiers", continued to serve as an important communications tool for industry, the research community, and other provincial and federal government departments.

B. AUDIO-VISUALS

In cooperation with British Columbia and the Yukon, work began on a ten minute video on science education at the elementary school level. Its main objective is to motivate elementary teachers to increase the quantity and quality of their teaching about science and technology. When complete in 1989, the video will be distributed to the 120 school divisions in Saskatchewan.

C. SPECIAL EVENTS

1. Science and Technology Week

Science and Technology Week evolved as a means of addressing the need to raise public awareness of scientific and technological activities in Saskatchewan.

Audiences for this event include young people, the research community, business and the general public, with different events targetted to each of these groups.

Events held during Science and Technology Week 1988 included a student writing contest, a showcase of student Science Fair winners, a "Tenant Fair" at Innovation Place in Saskatoon, industry displays at the Cornwall Centre in Regina, school tours, and distribution to schools of a biotechnology teaching package. Complementary activities during the Week included a "Looking Toward The Future" seminar and the Institute of Electrical and Electronics Engineers' Western Conference and Exhibition (WESTCANEX).

Planning for Science and Technology Week 1989 was also initiated during this fiscal year. Projected activities include a Premier's Breakfast, return of the popular showcase of student Science Fair winners, a technology "expo" which will tour the Province, Chamber of Commerce luncheons, and various other activities, all supported by concentrated advertising.

2. High Tech Entrepreneur Awards

Co-sponsored by the Department with Peat Marwick Chartered Accountants and the Saskatchewan Advanced Technology Management Association (SATMA), this awards program was initiated in 1989 to recognize and honour individuals who have made outstanding contributions to Saskatchewan technology

Award categories include:

Outstanding Achievement in Business

Innovation or Scientific Breakthrough

Outstanding Contribution to the High Tech Community.

C. INFORMATION COORDINATION

The Communications Division regularly organizes media events such as news conferences and media tours. Media releases are prepared and distributed on a regular basis. The Division assists in the preparation of feature articles in relevant publications. Advertising for special events, programs and other Department activities are placed to assist the advanced technology sector.

Liaison with industry/education groups and organizations such as SATMA (Saskatchewan Advanced Technology Management Association), SDAS (Software Developers Association of Saskatchewan), the Saskatchewan Science Centre, the Future Corporation, and A-STEP (Awareness-Science and Technology Education Program) was maintained. The Communications Division also acts as a communications resource to the Saskatchewan Advisory Council on Science, Technology and Innovation.

Saskatchewan Science and Technology is represented by the Communications Division on the Steering Committee of the National Science and Technology Week Committee and the National Public Awareness Campaign, both sponsored by Industry, Science & Technology Canada.

D. SUPPORT ACTIVITIES

The Communications Division helps to strengthen growth in Saskatchewan's advanced technology sector through supporting the work of other Divisions. Specific activities include the organization of Department participation and profile in trade shows and conferences. Communications also has a role to play in the hosting of foreign delegations in Saskatchewan such as the group from Jilin which toured the Province in 1988.

The Division also provides services to client companies, assisting them with their communications activities as requested.

Administration Division

The Division is responsible for the general administrative operation of the Department. It provides support services to the entire Department, including financial, human resources and computer systems management. The Division interacts extensively with the Department of Finance, the Saskatchewan Property Management Corporation, the Public Service Commission and other central agencies.

This fiscal year, the Administrative Services Division provided the following services:

A. HUMAN RESOURCES

- coordinated staff orientation, training and development.
- advised in areas such as staff relations, employment fairness, occupational health, the collective agreement, employee benefits, performance evaluations.
- initiated and coordinated the staffing of vacant positions
- coordinated the student employment program.

B. FINANCIAL MANAGEMENT

- participated in the preparation of the Departmental budgets.
- monitored and controlled Departmental expenditures.
- provided financial analyses and forecasts as well as accounting and procurement services.
- assisted the Deputy Minister and Directors in various projects and provided advisory services to the other Divisions regarding government legislation and regulations.

C. SYSTEMS MANAGEMENT

- the present system was enhanced with additional storage capacity.
- new databases were developed and existing ones refined and enhanced.
- in-house training wsa given in the use of the desk top publishing equipment.
- coordinated the relocation of computer equipment to the new office space in Saskatoon and Regina.

D. BUILDING, EQUIPMENT AND SUPPLIES

- the final step of the Department's relocation in Saskatoon to the East Wing of the SEDCO Centre was completed.
- the relocation of the Regina office from the T.C. Douglas Building to the Ramada Conference Centre was planned and completed.
- the Division managed the procurement of furniture, equipment and supplies.

E. ADMINISTRATIVE

- the Division provided records management, mail room services, and secretarial and other support services to the Department.

Accomplishments

A. RESEARCH COMMITMENT

Saskatchewan researchers have achieved world-wide recognition for their accomplishments in agriculture, space, instrumentation, software, medicine, and telecommunications technology.

Such work provides the foundation for future accomplishments, enabling Saskatchewan to position its industries to remain competitive in a rapidly changing world. The commitment for all the players to science and technology in Saskatchewan has been strong, with $148 million spent on research and development in 1987-88.

(See Appendix, Table 6)

- Saskatchewan industry in 1987-88 committed over $45 million to fund research and development activities in industry, universities and research organizations. On a per capita basis, Saskatchewan industry ranks fifth in Canada in funding research and development activity.

  (See Appendix, Table 6 & 7)

- The Saskatchewan Government in 1987-88 spent $18 million to support research and development activities in industry, universities and other research organizations. On a per capita basis, the Saskatchewan Government ranks third in funding research and development activity, surpassed only by Alberta and Quebec.

  (See Appendix, Table 6 & 7)

- Saskatchewan has succeeded in levering significant federal funds for science and technology in the province. This commitment in 1987-88 amounted to approximately $64 million for research and development. Agriculture Canada and the National Research Council, both federal government research facilities located in the Province, have pioneered the development of agriculture technologies and biotechnology for use worldwide.

- Federal science and technology procurement in 1988-89 in Saskatchewan totalled $3.4 million. Most of this went to Saskatchewan industry for the development of technology products and processes for the federal government. Such industrial opportunity is made possible through Saskatchewan's commitment to research and development support for advanced technology products.

- Saskatchewan's universities have an enviable record of leading science and technology development in the province. In fact, the universities have provided the foundation in expertise and facilities for many of Saskatchewan's advanced technology industries. The origins of many advanced technology firms can be traced back to Saskatchewan's universities. Examples include SED Systems Inc., BIOSTAR Inc., and SCI-TEC Instruments Inc.

B. INDUSTRY RESULTS

Saskatchewan's commitment to research excellence has enabled the science and technology community to continue to attract the expertise required to build an infrastructure of research facilities and advanced technology firms.

This research infrastructure resides in the institutions of Saskatchewan's universities, the National Research Council's Plant Biotechnology Institute, the POS Pilot Plant, the Regina Water Research Institute, the Saskatchewan Research Council, and the Veterinary Infectious Disease Organization, to name only a few.

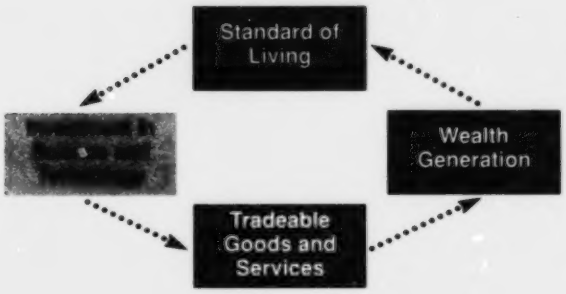
The depth of this research infrastructure has supported the development and growth of an advanced technology industry which now numbers in excess of 170 firms, with sales of approximately $500 million, employing approximately 3,000 people.

The following are a few industry achievements which have helped Saskatchewan's advanced technology sector grow and prosper, diversifying and building a future for Saskatchewan:

- First foreign instrumentation, ever, on a Japanese satellite, launched in 1989
- An internationally accepted state-of-the-art fluid monitoring system for petroleum and other fluid storage tanks
- Weigh-in-motion electronic scales for traffic monitoring and urban planning which are marketed world-wide
- Data Communications System for NASA's Johnson Space Centre
- Pioneering work on development of bioherbicides for environmentally safe control of weeds
- A Brewer Ozone Spectrophotometer to measure the earth's ozone levels
- Automated teller card technology to enhance the efficiency of banking services
- Automated health card system for the comprehensive dispensing of health services
- Environmental impact software used to tackle the Exxon Valdez oil spill in Alaska

Future Directions

Science-based innovation has become the driving force for technological and corporate change in the global economy, creating tradable goods and services and, hence, prosperity. A modern, viable economy must continually invest in science and technology to ensure a wealth-generating capability from international markets which will support quality of life requirements in areas such as health and education. Without this wealth-generating capability in the international marketplace, an economy will experience declining standards of living.



The future is bright. Saskatchewan Science and Technology continues to support the development of the advanced technology sector in order to position Saskatchewan to:

- lead the world in the development of agriculture biotechnology products and processes;
- achieve world-wide markets for the development of environmentally safe technologies;
- develop leading edge technology in telecommunications and instrumentation;
- participate in the development of new technologies for Canada's Space Program;
- become a leading developer of computer software for agriculture, business, aerospace and electronics applications;
- establish educational programs in science and technology for our youth which will encourage them to become the science entrepreneurs of tomorrow.

Direct benefits to Saskatchewan include:

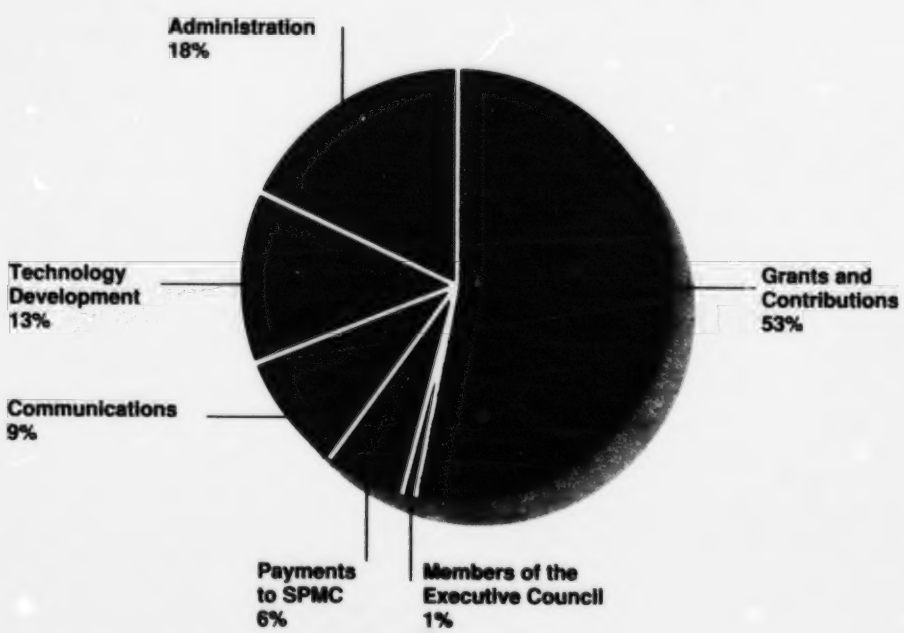
- creation of quality jobs in research and development;
- creation of quality jobs in manufacturing and processing related to the production of technologically advanced goods and services;
- diversification and strengthening of the economy through the application of new technologies to traditional resource and secondary sectors;
- increased industry access to advanced technology procurement opportunities;
- new and expanding international markets for Saskatchewan's advanced technology products;
- increased cooperative efforts between industry and universities in research and product development;
- improved environmental protection and quality of life in Saskatchewan through research and development;
- increased public understanding of the importance of science, technology and innovation for Saskatchewan's future well being.

Financial Review

Statement of expenditures for the fiscal year ending March 31, 1989

Consolidated Fund Science and Technology	
Administration	$751,647
Technology Development	516,949
Communications	363,790
Payments to Saskatchewan Property Management Corp.	266,203
Members of the Executive Council	37,070
Total	**$1,935,659**

Consolidated Fund Economic Diversification and Investment Fund	
Grants and Contributions	$2,162,437
Total	**$2,162,437**



Appendix

Table 1

Research and Development Grants and Contributions April 1, 1988 - March 31, 1989

Firm	$
A.B. Data Sales Saskatoon Industrial Research	16,012
Canadian Centre for Creative Technologies Waterloo Information Transfer	40,000
Canadian Lightwave Technologies Ltd. Saskatoon Industrial Research	28,375
City of Saskatoon Saskatoon Special Studies	65,500
Innovative Research Inc. Regina Industrial Research	134,022
International Road Dynamics Inc. Saskatoon Joint High Technology Research	30,000
Kjosness, Dr. Donald H. Saskatoon Special Studies	10,000
Management Systems Ltd. Regina Industrial Research and Request for Proposal	19,348
P.O.S. Pilot Plant Corp. Saskatoon Research Infrastructure	100,000
Peat Marwick & Partners Saskatoon Information Transfer	10,000
Philom Bios Inc. Saskatoon Industrial Research	384,106
Prairie Malt Limited Biggar Industrial Research	87,010
Prairie Systems & Equipment Ltd. Saskatoon Industrial Research	51,805
Regional Science Fairs Saskatchewan Special Studies	4,100
Rhizogen Corp. Saskatoon Industrial Research	39,175
SCI-TEC Instruments Inc. Saskatoon Industrial Research	11,900
SED Systems Inc. Saskatoon Special Studies and Request for Proposal (3)	35,000
Saskatchewan Research Council Saskatoon Special Studies and Research Infrastructure (2)	32,913
Saskatchewan Science Centre Regina Research Infrastructure	250,000
Saskatoon Board of Education Saskatoon Special Studies	10,000
Science Writing Contest Winners Saskatchewan Special Studies	600
Settler Computer Technologies Regina Information Transfer	3,440
Spectrum '89 Saskatoon Information Transfer	5,000
Standard Computer Ltd. Saskatoon Industrial Research	24,133
Statistics Canada Ottawa Special Studies (2)	13,500
Synco Oil and Chemical Corp. Saskatoon Industrial Research	12,575
University of Regina Regina Research Infrastructure (4)	122,788
University of Saskatchewan Saskatoon Research Infrastructure (13)	158,818
Western Engineering Competition Calgary Special Studies	2,000
Total value of contracts signed during the fiscal year	**$1,702,120**
Total work done and paid out to firms	**$1,624,416.67**

Notes:

Payments include work done under contracts signed in the current fiscal year, as well as contracts signed in prior fiscal years.

Table 2

Canada/Saskatchewan Subsidiary Agreement on Advanced Technology Grants and Contributions April 1, 1988 - March 31, 1989

Firm	$
Accutrak Systems Ltd. Regina First User Risk Reduction Program and Bridging Capital Assistance	34,375
Agrivision Processing Co. Rocanville Marketing Support	15,000
Ag-West Biotech Inc. Saskatoon Task Force and Project Teams	306,035
Baby Guard Inc. Kindersley Marketing Support	18,225
Beck Technology Inc. Regina First User Risk Reduction Program (2)	25,920
CAPA Software Corporation Saskatoon Bridging Capital Assistance (2)	182,927
City of Saskatoon Saskatoon Development Analysis	50,000
Cortech Systems Ltd. Saskatoon Development Analysis	14,000
High-Line Manufacturing Inc. Vonda Marketing Support	12,354
Intelligent Transportation Systems Corp. Saskatoon Marketing Support and First User Risk Reduction Program	42,557
International Road Dynamics Saskatoon Marketing Support	13,400
ISIC Technologies Inc. Saskatoon Marketing Support	2,950
Management Systems Ltd. Regina Marketing Support	25,000
Philom Bios Inc. Saskatoon Bridging Capital Assistance	100,000
Prairie Systems & Equipment Ltd. Saskatoon First User Risk Reduction Program	7,800
Saskatoon Information Services Saskatoon Marketing Study	1,200
SATMA Saskatoon Development Analysis	14,850
SCI-TEC Instruments Inc. Saskatoon First User Risk Reduction Program	5,380
SED Systems Inc. Saskatoon Development Analysis	96,113
University of Saskatchewan Saskatoon University/Industry Collaboration	150,000
Willock Industries Ltd. Regina Marketing Support	25,000
WIO Research Association Inc. Saskatoon Task Force and Project Teams	92,201
Total value of contracts signed during the fiscal year	**$1,235,287**
Total work done and paid out to firms	**$538,020.63**

Notes:

Payments include work done under contracts signed in the current fiscal year, as well as contracts signed in prior fiscal years.

Table 3

Advisory Council on Science, Technology and Innovation

The following is the membership of the Advisory Council as of March 31,1989:

Chairperson

Honourable Ray Meiklejohn,
Minister of Science and Technology

Members

Dr. Stephen Acres, Director of VIDO
President of BIOSTAR
Dr. J. Blackburn, Dean of Pharmacy,
University of Saskatchewan
Dr. Bruce Cooke, Dean of Engineering,
University of Regina
Mr. Milt Fair, CEO, Saskatchewan Wheat Pool
Mr. Bill Gatenby, Chairman,
President & CEO, CAMECO
Mr. Jerome Getz, President,
Innovative Research Inc.
Mr. Jim Hutch, President,
Saskatchewan Research Council
Mr. Richard MacPherson, President & CEO,
Develcon Electronics Ltd.
Dr. Jack Manns, Dean of
Graduate Studies & Associate
Vice-President, (Research)
University of Saskatchewan
Mr. Fred Mitchell, President & CEO,
Intercontinental Packers
Mr. John Somers, Executive Vice President,
Kilborn Engineering Ltd.
Dr. Warren Steck, Director, Plant
Biotechnology Institute
Mr. Terry Summach, President, Flexicoil
Mr. Gerald Thom, President,
Westbridge Computer Corporation

Table 4

Federal Government Science and Technology Procurement, 1987-88 and 1988-89

Province	1987-88 Value ($M)	%	1988-89 Value ($M)	%
B.C.	40.8	15.5	34.9	16.2
Alta	20.0	7.6	13.4	6.2
Sask.	8.2	3.1	3.4	1.6
Man.	6.2	2.4	5.7	2.6
Ont.	121.4	46.2	98.6	45.8
Que.	32.4	12.3	30.2	14.0
N.B.	3.7	1.4	4.4	2.0
N.S.	17.7	6.7	13.2	6.1
PEI	0.4	0.2	0.6	0.3
Nfld	6.2	2.4	6.3	2.9
Yukon & NWT	0.4	0.2	0.2	0.1
Other*	7.1	2.7	4.5	2.1
Canada	264.5	100.0	215.4	100.0

* Includes contracts which cannot be allocated to any specific geographic area.

Source: Supply and Services Canada, Research and Development Bulletin

Highlights: Saskatchewan in 1988-89 received 1.6 percent of federal science and technology procurement contracts, a substantial decrease from 1987-88.

Table 5

Networks Of Centres Of Excellence Applications Having Saskatchewan Participation

A. UNIVERSITY OF SASKATCHEWAN

Petroleum Reservoir Simulation
Bacterial Diseases
Ocean Research and Development
Mineral Industry
Education in Science and Technology
Advanced Manufacturing Research
Pharmacoepidemiology
Computing and Information Technology
Advanced Food Processing
Plant Protection
Future Electrical Energy Systems
Grain Quality Research
National Fusion Program
Nursing Informatics
Toxicology
Tribological Innovation
Respiratory Health
Neural Regeneration and Functional Recovery
Residential Building Technology
Technologie, innovation et integration dans le domain du transport
Hydrogen and Electrochemical Studies
Plant Stress
Technology Transfer Process
Molecular and Interfacial Dynamics
Control of Infectious Diseases
Advanced Minerals Exploration
Earth Resources
Robotics and Intelligent Systems
Anti-viral and Vaccine Strategies in HIV-I Associated Disease
Radiopharmaceuticals
Oilseed Enhancement
Forest Industries
Knowledge Systems
Hydrocarbon Energy
Brassica Juncea
Sequencing the Yeast Genome
Enhanced Production in the Resource Industries
Technology Innovation Management
Effective Communication in International Languages
Microbial Ecology
Space Research
L'irradiation et ses applications
Molecular Recognition of Cell Surface Carbohydrates
Groundwater Research
Bioprocessing Innovations for Industrial Biotechnologies
Biotechnology of Mammalian Growth and Reproduction
Conception et evaluation des amanagements hydrauliques
Atmospheric Chemistry
Pavement Research
Microgravity
Computer Assisted Rational Drug Design

B. UNIVERSITY OF REGINA

Petroleum Reservoir Simulation Network
Education in Science and Technology
Canadian Network for Advanced Manufacturing Research
Research de la memoire des pioniers de l'Quest
The Earth Resources Research and Application Foundation
Knowledge Systems Centres Network
Resources Industry Productivity and Profitability
Hydrocarbon Energy Research
The Canadian Drinking Water Research and Development Network
Centre of Excellence for Effective Communication in International Languages
Education for Technological Literacy Linked to Economic Development

Table 6

Saskatchewan Gross Expenditures ($M) on Research & Development (GERD), 1987-88

	PERFORMING SECTOR							
Funder	Fed. Gov't	Prov. Gov't	Pro	Business Enterprise	Higher* Education	Private Non-Profit	Total	
Governments								
Fed.	39	0	1	4	20	0	64	43%
Prov.	0	3	3	2	10	0	18	12%
PRO	0	0	0	0	0	0	0	0%
Business Enterprise	0	0	2	40	3	0	45	30%
Higher Education	0	0	0	0	17	0	17	11%
Private Non-Profit	0	0	0	0	2	0	2	1%
Foreign	0	0	0	2	0	0	2	1%
TOTAL	**39**	**3**	**6**	**48**	**52**	**0**	**148**	**100%**
	26%	**2%**	**4%**	**32%**	**35%**	**0%**	**100%**	

*Statistics Canada estimate of operating funds allocated for R & D based on portion of time spent on R & D.

Source: Statistics Canada, Estimates of Canadian Research and Development Expenditures by Regions, 1979 - 1987.

Highlights: In Saskatchewan, the Federal and Provincial Governments together funded 55 percent of R & D in 1987 - 88. The single largest performers of R & D were the business and university sectors at 32 and 35 percent respectively.

Table 7

Gross Per Capita Expenditures ($) on R & D by Funding Sector and Province, 1987-88

Prov	Fed.Govt	Prov.Govt	Industry	Education	Non-Profit	Other	Total
B.C.	65 (6)	10 (5)	58 (4)	17 (8)	4 (5)	3 (6)	157 (6)
Alta.	47 (10)	41 (1)	82 (3)	50 (1)	4 (6)	4 (4)	229 (3)
Sask.	63 (8)	18 (3)	44 (5)	17 (7)	2 (7)	2 (7)	146 (7)
Man.	89 (3)	6 (8)	26 (6)	38 (2)	11 (1)	2 (8)	172 (5)
Ont.	127 (1)	15 (4)	191 (1)	35 (4)	7 (2)	58 (1)	433 (1)
Que.	73 (5)	27 (2)	127 (2)	12 (10)	6 (3)	15 (3)	260 (2)
N.B.	55 (9)	7 (7)	24 (7)	21 (6)	0 (9)	18 (2)	125 (8)
N.S.	117 (2)	6 (9)	19 (8)	31 (5)	5 (4)	3 (5)	181 (4)
P.E.I.	79 (4)	0 (10)	8 (11)	16 (9)	0 (9)	0 (10)	102 (10)
Nfld.	63 (7)	7 (6)	12 (10)	37 (3)	2 (8)	2 (9)	123 (9)
Yukon/NWT	13 (11)	0 (10)	13 (9)	0 (11)	0 (9)	0 (10)	26 (11)
Canada	90	19	120	27	6	27	289

( ) Rank

Source: Statistics Canada, Estimates of Canadian Research and Development Expenditures by Region 1979-87.

Highlights: Saskatchewan ranks 8th in Federal per capita expenditures on R & D. The Saskatchewan Government ranks 3rd in Provincial Government per capita expenditures on R & D. Saskatchewan industry ranks 5th in comparison to industries in other provinces for per capita expenditures on R & D.

Table 8

Science and Technology Expenditures by Government of Saskatchewan Department/Agency and Performer, 1987-88

Department or Agency	Intramural	Industry	Universities	Hospitals and Health Organizations	SRC (1)	Other	Total
Departments			($ Thousands)				
Agriculture	1,093	1,828	5,994	-	744	2,859	12,518
Consumer & Commercial Affairs	40	-	-	-	-	-	40
Economic Development & Tourism	110	68	-	-	-	56	234
Education	476	80	21	-	-	148	725
Energy & Mines	716	3,543	300	-	758	63	5,380
Environment & Public Safety	1,494	22	200	-	-	10	1,726
Executive Council	-	101	2	-	-	91	194
Finance	1,751	-	-	-	-	11	1,762
Health	1,305	15	2,229	-	-	614	4,163
Highways & Transportation	2,105	863	330	-	-	-	3,298
Human Resources, Labour & Employment	300	3	-	-	-	13	316
Justice	180	-	-	-	-	-	180
Parks, Recreation & Culture	1,492	485	14	-	-	4	1,995
Public Service Commission	61	-	-	-	-	5	66
Rural Development	72	223	-	-	-	-	295
Science & Technology	1,718	2,128	150	-	-	-	3,996
Social Services	527	786	105	-	-	10	1,428
Urban Affairs	165	-	-	-	-	17	182
Saskatchewan Research Council (1)	-	-	-	-	6,443	-	6,443
Sub-total	13,605	10,145	9,345	-	7,945	3,901	44,941

Agencies:							
Cancer Foundation	393	-	-	-	-	-	393
Highway Traffic Board	-	-	-	-	-	-	-
Sask. Archives Board	883	-	-	-	-	-	883
Sask. Crop Insurance Corp.	155	-	-	-	-	-	155
Sask. Housing Corp.	94	100	-	-	-	-	194
Sask. Property Mngt. Corp.	275	280	-	-	-	-	555
Sask. Water Corp.	20	-	-	-	-	-	20
Sub-total	1,820	380	-	-	-	-	2,200
TOTAL:	**15,425**	**10,525**	**9,345**	**-**	**7,945**	**3,901**	**47,141**

* Estimate of approved expenditures.

(1) Includes only Provincial Government payments to the SRC.

Source: Statistics Canada, Scientific Activities of the Government of Saskatchewan, 1987 - 88.

Highlights: Out of a total of 47 million expended by the Government of Saskatchewan on science and technology, 33 percent is expended intramurally and 67 percent is extramural. Of the extramural expenditures, the universities receive 29 percent and industry 33 percent.